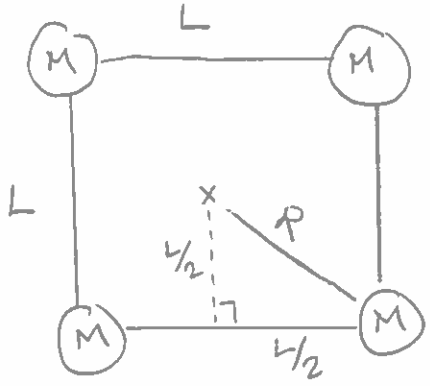

A mobile sculpture is made of 4 iron balls of mass M each. They are connected by massless rods of length L, and spin around the central point marked "X".

The distance from center to each ball is

$$R^2 = \left(\frac{L}{2}\right)^2 + \left(\frac{L}{2}\right)^2 = \frac{2L^2}{4} = \frac{1}{2}L^2$$

$$\rightarrow R = \sqrt{\frac{1}{2}L^2} = \frac{\sqrt{2}}{2}L$$

So the moment of inertia of the sculpture, around its center, is

$$I = 4\left(MR^2\right) = 4\left(M\,\tfrac{1}{2}L^2\right) = 2ML^2$$

If the sculpture is spun around its center with period P, then

$$\text{ang velocity } \omega = \frac{2\pi\ (\text{rad})}{P\ (s)} = \frac{2\pi}{P}$$

and so the rotational kinetic energy is

$$\text{rot KE} = \frac{1}{2}I\omega^2 = \frac{1}{2}\left(2ML^2\right)\left(\frac{4\pi^2}{P^2}\right)$$

$$= \frac{4\pi^2 ML^2}{P^2}$$